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SUSQUEHANNA RIVER BASIN COMMISSION

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Level

I. INTRODUCTION

A. Description of the Project

The most recently completed U.S. Army Corps of Engineers Flood Control Study in the West Branch Susquehanna River Basin was directed to the development of a single purpose plan to provide protection to the City of Lock Haven, Clinton Co., Pa., against flooding from the West Branch and Bald Eagle Creek.

The flood control plan formulated by the Corps calls for construction of flood walls and levees with associated interior drainage and closure structures. This plan is considered by the Corps at this time as the soundest, most practical and most economical plan of protection for Lock Haven.

Generally, the protection plan is divided into two sections due to the geographic layout of the City. The principle area to be protected is along the Susquehanna River and consists primarily of the central business district and residential housing. Another area to be protected is along Bald Eagle Creek where land use is primarily agricultural and industrial. The selected plan requires 7,000 feet of conventional concrete flood wall reaching a maximum height of 18 feet. Earthen levees will be required in various other sections of the area to be protected. A section of this earthen levee will be formed by the proposed U.S. 220 Lock Haven By-

pass. Lusk Run, a tributary to the West Branch Susquehanna River at the upstream end of the project, will be diverted to the West Branch Susquehanna River upstream of the proposed levee. Piper Aircraft Company, located at the downstream end of the West Branch Susquehanna River section of the project will be totally protected, including the airport proper. Hammermill Paper Company, situated along the upstream end of the Bald Eagle Creek portion of the project, will also be protected with the exception of the wastewater ponds used by the plant.

A boat launching area is proposed across the river in Lockport in place of the previously proposed facility within the City of Lock Haven. See Figure 2 for general plan of proposed project features.

The proposal lists 12 closure structures to be located at intersections of the wall/levee system with railroads, highways and the Pennsylvania Canal. The principal interior drainage facilities will consist of four pumping stations, four ponding areas, gravity outlets to convey storm drainage through the line of protection during periods of low flow on the river and creek, and interceptor drains.

1. Flood History-Lock Haven

Since 1847, when recording of flood information was initiated, the City of Lock Haven has been flooded 19 times with major floods occurring in 1889, 1894, 1936, 1946, 1950,

1964 and 1972. The flood of record occurred in 1936 and the most recent major flood which occurred as a result of Tropical Storm Agnes in June 1972 came within two feet of this record level. The 1972 flood inundated over 55% of the City causing damages estimated to be in excess of \$50 million. A recurrence of this flood today would result in an estimated loss of \$84.5 million. In addition to inundation during major runoff events it should be noted a 10-year frequency flood is sufficient to overtop the banks and cause flooding within the City.

B. Purpose & Basis of this Review

The Commission, created by a Federal-Interstate Compact, P.L. 91-575 (84 Stat. 1509 et seq.), is the regional government agency responsible for effecting comprehensive multi-purpose planning, programming and management of the water and related resources for the Susquehanna River Basin. It fulfills this mandated duty by exercising authority in the Compact providing for implementation of its Comprehensive Plan for management and development of the water resources of the Susquehanna River Basin, coordination of planning efforts and programs of government agencies and the private sector, and review of projects affecting the water and related resources of the basin.

The Commission reviews projects to ascertain the projects' compatibilities with the objectives, goals, guidelines and criteria set forth in the Comprehensive Plan. The purpose

of this review is to evaluate the Lock Haven Flood Protection Project proposed by the Corps of Engineers in terms of the Commission's objective and goals for flood damage reduction which are:

Program Objective

To prevent loss of life and significantly reduce future damages from floods within the basin through an integrated system of structural flood control and nonstructural flood plain management measures.

Goals

- a. A basinwide flood plain use plan to guide flood plain development and redevelopment so as to prevent loss of life and reduce future flood damage.
- b. Effective control over flood plain use and development in all areas susceptible to flooding.
- c. Increased flexibility in Federal policies to enable allocation of Federal funds for flood plain management, land acquisition, and other nonstructural measures.
- d. A basinwide program of flood damage reduction structures that includes consideration of multipurpose water storage and is integrated with nonstructural flood plain management measures.
- e. Establishment of an improved and expanded flood forecasting and warning system to provide the

maximum amount of time during which evacuation and other damage reduction measures may be taken.

This review is based upon the following information:

1. Phase I General Design Memorandum - Main Report, dated April, 1980, Phase I Advanced Engineering and Design Studies, Appendix A - Problem Identification, Appendix B - Plan Formulation, Assessment and Evaluation, Appendix C - Public Views, Appendix D - Hydrology, Hydraulics and Internal Drainage, Appendix E - Design Details and Cost Estimates, Appendix F - Economics, dated April 1980.
2. Testimony presented at a joint public meeting held with the Corps of Engineers on April 29, 1980 in Lock Haven, Pa.
3. Meeting with Corps and Pa. DER personnel.

II. DISCUSSION

A. Areas of Concern

Evaluation of the project in terms of the SRBC Comprehensive Plan, review of the Phase I General Design Memorandum, and consideration of public expressions at a joint Corps/SRBC public meeting on April 29, 1980 resulted in the identification of several issues as follows:

1. Regional Flood Control

The West Branch Susquehanna River has a long history of flooding with a growing record of loss of life, property damage and general economic upheaval to the communities along its banks.

The obvious flood prone nature of the West Branch Susquehanna River Valley has triggered Federal funding of several broad, regional flood control studies by the Corps of Engineers. These studies generally have been directed toward identifying reservoir sites with large storage capacity and the formulation of a regional system to reduce flood stages along the West Branch and other major tributaries of the Susquehanna River. The need was also identified for local protection projects at certain flood prone areas, including a project at Lock Haven.

The first extensive study of flood control in the West Branch basin is contained in a report entitled Preliminary Examination and Survey of the Susquehanna River Basin and Tributaries, House Document 308, 69th Congress, 1st Session, dated May 6, 1938. Many sites for impoundments were investigated with major locations on the West Branch being identified at Keating, Westport and Cooks Run. On the basis of this study flood control dams were found feasible at Keating, Kettle Creek, Mill Hall and Blanchard. The Westport site was considered to be the

most advantageous main stem location and the report recommended construction of a multi-purpose dam at the site.

A second study embodied in House Document 702, 77th Congress, 2nd Session, dated 1942, was a review of House Document 308. This report concluded that a dam at Westport was feasible in terms of its potential to control runoff from a large drainage area. Since the dam could not be economically justified on the basis of flood control alone, it was recommended that construction be deferred until electric power generation could be included as a purpose at the site. The additional reservoir sites considered in this study were Curwensville, Keating, Huntley, Salona and Ramsey. It was determined that the flood stages at Lock Haven due to a recurrence of the 1936 flood would be reduced by 10 feet by the Westport Dam, and 6 feet by the Keating Dam.

The regional approach to providing flood control in the West Branch Valley was continued in the late 1940's when the Corps of Engineers, Baltimore District, initiated a review of House Document 702. The results of the study are contained in House Document 29, 84th Congress, 1st Session, dated October 7, 1954. Thirty sites were investigated for flood control purposes and four dams were recommended for authorization. These four have since been built at the Kettle Creek (Alvin Bush Dam),

Stevenson, Curwensville and Blanchard (Sayers) sites. The Keating Dam was deferred for future study. An important and recurring theme of the three Corps of Engineers studies was the need for upstream storage measures to provide broad regional control of flooding along the West Branch Susquehanna River.

A comprehensive study of the water resources of the Susquehanna River Basin was initiated in 1963 on the basis of resolutions adopted in 1961 by the U.S. Senate Committee on Public Works and in 1962 by the Committee on Public Works of the House of Representatives.

Consideration of flood control throughout the Susquehanna River Basin was one of the several purposes of this study. The study was chaired by the Baltimore District of the Corps of Engineers, and was completed in 1970. In its report 20 sites for flood control dams upstream of Lock Haven were identified, including the Keating project. The Westport and Cooks Run sites identified in earlier studies were eliminated from further consideration. The Keating site which included power generation facilities reportedly was not recommended because of anticipated high construction and relocation costs. The final report recommended construction of many reservoirs throughout the Susquehanna River Basin, most of which were small with limited potential for flood storage. Wall/levee type of flood protection was recommended at major damage centers, including

Lock Haven. Recommendations were also made for initiation of nonstructural measures at numerous sites throughout the Susquehanna River Basin to achieve reduction of future flood damages.

These findings and recommendations placed a low priority on flood control, relying mainly on local protection works and thus, differed somewhat from the recommendations presented in the several earlier flood control studies in the Susquehanna River Basin.

The Baltimore District office of the Corps has completed its study of the West Branch Susquehanna River portion of the Susquehanna River Basin Flood Control Review Study. Although the study has not been published, the Phase I Advanced Engineering and Design Studies document provides a critique of the findings. In general, all alternative solutions to Lock Haven's flooding problem other than the wall/levee alternative have been determined not to be economically justified; impractical; low in economic returns; ineffective in meeting the technical, economic and environmental criteria; or, will not accomplish the planning objectives.

Currently, the West Branch subbasin contains four flood control dams above Lock Haven, and two communities along or directly influenced by the West Branch - Williamsport and Sunbury - have local flood protection projects. There remain

14 cities and boroughs (see Figure No. 1) along the West Branch (1970 population of greater than 1,000) including Lock Haven, plus numerous townships, which are vulnerable to flooding and did experience significant flood damages from Hurricane Agnes in 1972. In addition, the Cities of Williamsport and Sunbury barely escaped inundation during the flood of 1972 by narrow margins estimated at 0.3 feet at Williamsport and 0.5 feet at Sunbury.

The Agnes flood clearly demonstrated the existing widespread vulnerability to flood damage of communities throughout the West Branch Susquehanna River drainage area. The extent of the flood hazard and the number of communities involved indicates the need for continuing consideration of a regional solution rather than a progressively dependent piecemeal approach to reduce future flood damages.

2. Consideration of Alternatives

The Corps of Engineers Lock Haven Flood Protection Phase I Advanced Engineering and Design Studies includes consideration of alternatives to the proposed project. This analysis provides discussion of both structural and nonstructural alternatives to the levee/wall proposal.

The consideration of these alternative solutions for reduction of future flood damage, other than variations of the wall/levee plan were discussed in greater detail than previous reports on this project. Although the conclusions

of the discussions appear valid, the Commission staff is concerned that measures providing regional flood damage reduction were not found to be worthy of further consideration.

3. Project Impact

The proposed local flood protection project at Lock Haven is designed to provide protection against the Standard Project Flood or a river discharge of 310,000 cfs. This would provide an average levee height seven feet above the June 1972 flood. The high degree of protection should afford the City freedom from the repeated occurrence of flood damages it has suffered since its founding in 1834. Benefits of this protection should be recognizable in an improved economic climate in the City and in the security provided against the high frequency of flooding.

To achieve this high level of local protection certain trade-offs must be accepted - some by City residents and others by residents living in areas adjacent to the proposed project.

Although considerable consideration was given to preservation of the aesthetic amenities, the view of the West Branch Susquehanna River will be effectively blocked off except at the openings left for bridges and railroads. The wall will average 18 feet in height as it bounds the City along the West Branch with visibility of the river virtually

eliminated. The problems of access to the river will be increased due to the height of the wall and the limited number of openings planned.

The security from flooding by the wall/levee system can be expected to encourage more intensive development within the protected area. These kinds of areas suffered the most extensive damage during the Agnes event.

There will be considerable local land rights, relocation and financing costs which City and Woodward and Castanea Township residents will have to bear. The State normally assumes up to one-half of these local costs; however, the routine maintenance and operation costs of the completed project will be the responsibility of the City. This will include storage and upkeep of closure structures and the training of crews to properly install the closures in time of emergency. Maintenance of the wall should be minimal; however, proper upkeep of the levees and the several pumping stations is a matter requiring regular attention.

Upstream-Downstream Concerns -- The proposed project can be expected to cause an increase in the flood stage for immediately adjacent and downstream communities. However, due to the increased flood heights resulting in Lockport, a community across the river from Lock Haven and two upstream communities, it will be necessary to relocate 139 structures.

Implementation of the local protection project for Lock Haven will considerably reduce and may fully preclude any future opportunity to economically justify regionally significant, upstream flood water detention measures. Similarly, the proposed project could effectively eliminate further consideration of upstream structural measures for the resolution of other water resource related problems such as water supply, power production, low flow augmentation, water pollution control and recreation.

By reducing the potential to justify upstream storage the remaining downstream flood prone areas of communities along the West Branch might be committed to wall/levee solutions, evacuation or no protection. Piecemeal community-by-community flood protection solutions may well exceed the time and cost of a carefully considered regional solution or combination of structural and nonstructural measures.

4. Economic

Since the 1972 flood, the damage base in Lock Haven has changed considerably. Hence, a revised damage estimate was prepared from data gathered from field appraisals of all residential and most commercial properties for use in the generalized flood damage appraisal system (Baltimore District's Flood Damage Assembly Program) during the spring and summer of 1978. Stage-damage relationships

were updated to December 1979 price levels and converted to relate to the Jay Street gage on the West Branch Susquehanna River thereby obtaining an elevation-damage relationship for the entire municipality.

Residential, commercial, industrial and public facilities in general comprise about 95% of the total potential damages. Utilities, transportation and community emergency comprise the remainder. Potential damages resulting from a Standard Project Flood are estimated to be \$132.4 million while \$105.6 million potential damage would result from a recurrence of the 1936 flood.

Flood damage surveys were also conducted in Lockport and two small communities upstream of Lockport, all along the northern side of the West Branch Susquehanna River across from Lock Haven.

Total existing average annual flood damages are estimated to be approximately \$4.41 million. Standard Project Flood level of protection would provide approximately \$4.25 million in average annual benefits and 1936 Flood level of protection would provide approximately \$3.82 million in average annual benefits.

Total average annual benefits accruing from the relocation plan are \$148,000. Annual recreation benefits amounting to \$119,000 will be realized through the provision of a jogging and bike trail along the levee and additional boat launch facilities.

With the addition of employment benefits and future benefits, the total average annual benefits attributable to the Standard Project Flood level of protection is approximately \$5.1 million and from 1936 Flood level of protection is approximately \$4.6 million.

Total investment cost of the project is approximately \$60 million (\$4.4 million annually) for the Standard Project Flood level of protection and approximately \$51.2 million (\$3.7 million annually) for 1936 Flood level of protection.

The benefit-cost ratio for the 1936 Flood level of protection and the Standard Project Flood level of protection are 1.2 and 1.17 respectively. Net annual benefits as well as cost-benefit ratio are greater for the 1936 level of protection than for the Standard Project Flood plan. The incremental benefit to cost ratio for the Standard Project Flood plan is 0.8 to 1.0.

5. Public Response

Protection of the City of Lock Haven from flooding by the West Branch and Bald Eagle Creek, by construction of a wall/levee system, has been advocated by the Corps of Engineers dating to 1936. In the course of the several previously noted Corps studies of flood problems in the West Branch drainage area, local protection for Lock Haven repeatedly has been discussed or recommended. Local sup-

port for a local protection project was not evidenced at the conclusion of the several earlier studies.

The current study and the resulting recommendation for a wall/levee system to provide flood protection for the City of Lock Haven was initially rejected by the City. City Council favored the concept of "flood control" as opposed to individual community "flood protection" and supported a detailed and extensive analysis of watershed impoundments similar in scope to that done for the wall/levee system proposal. The Corps responded to the Council's position by letter which noted that (1) in view of the City Council's opposition to the wall/levee system the Corps would recommend Congress take no further action towards providing a local flood protection project at Lock Haven, and (2) that funds for other studies, presumably meaning reconsideration of major and minor upstream storage measures, had not been made available by Congress.

The City Council apparently concluded from the Corps' letter that upstream retention would not become a reality which left the City with the alternatives of either supporting the local flood protection project, continued flooding, or a large scale flood plain management program which would be tantamount to evacuation of a major part of the City. After about one year of deliberation the City Council reversed its position and voted to support the project. Justifying their reversal they stated that, "We have

come to the realization that Lock Haven cannot champion regional solutions if it means our citizens continue to suffer."

Prior to initiating formal review of the proposal the Commission requested that a joint SRBC/Corps public meeting be held to obtain further public comment on the proposal. This initial public meeting was held on August 20, 1974 at Lock Haven.

The seriousness of the Lock Haven flood hazard, the obvious need for an increased regional level of flood control and the widespread opposition to a purely local solution to flood protection at Lock Haven were the major topics addressed in the statements presented at the August 20, 1974 meeting. During the meeting there was considerable "give and take" discussions of these topics among Commission members, Corps staff, those presenting statements and the audience.

A review of the testimony presented at the meeting and that submitted in writing for the record indicates that City Council, City-oriented agencies, commercial and industrial interests, and a goodly number of City residents favored the project.

Favor of upstream retention or other measures was expressed by the Clinton County Commissioners, the Clinton County Planning Commission, several adjoining communi-

ties and townships, representatives of local, regional and national associations, and by citizens from the City and other areas.

The following Table No. 1 identifies the municipal governmental agencies favoring a regional solution and those favoring the proposed Lock Haven Local Flood Protection Project.

Table No. 1

AUGUST 20, 1974
MUNICIPAL GOVERNMENTAL AGENCIES FAVORING A REGIONAL SOLUTION
AND THOSE FAVORING THE
PROPOSED LOCK HAVEN LOCAL FLOOD PROTECTION PROJECT

<u>Favoring a Regional Solution</u>				<u>Favoring the Lock Haven Local Flood Protection Project</u>	
<u>County</u>	<u>County Comm.</u>	<u>Co. Planning Commissions</u>	<u>Cities, Boroughs, Townships</u>	<u>County</u>	<u>Cities, Boroughs, Townships</u>
Clinton	Clinton	Clinton	Avis Boro. Beech Creek Boro. Flemington Boro. Mill Hall Boro. Renovo Boro. Allison Twp. Colebrook Twp. Dunstable Twp. Logan Twp. Pine Creek Twp. Woodward Twp.	Clinton	Lock Haven City Castanea Twp.
Lycoming	--	-	Williamsport City Duboisstown Boro. Jersey Shore Boro. Montoursville Boro. Muncy Boro. S. Williamsport Boro. Nippenose Twp. Porter Twp.		
Northumberland	--	--	Sunbury City Watsontown Boro.		
Union	Union	--	Lewisburg Boro.		

A second public meeting, which was also co-chaired by the Corps and the Commission was held on April 29, 1980 following completion of the Phase I Advanced Engineering and Design Study documents.

Although the concern for a regional solution to the flooding problems in Lock Haven was not as widespread as during the previous public meeting, it remains a point of interest. Primarily, discussions centered around the cost of the proposed project and the method to be used to determine the method of cost-sharing to be applied. The major point of debate was whether the apportionment of costs should be according to the President's June 1978 water policy message to Congress which requires approximately \$11.3 million as the non-Federal share or application of the existing cost-sharing policy that would require \$4.2 million as the non-Federal share.

Woodward Township officials also expressed concern over the portion of costs they would be asked to contribute as their share of Lockport area relocations and the possible loss in tax base should the relocation result in displacement of the families out of the Township's corporate limits.

III. SUMMARY & RECOMMENDATIONS

The vulnerability to flooding of communities along the West Branch Susquehanna River is well established. Lock Haven, a major damage center during the 1972 flood, is an outstanding example of the high level of susceptibility of West Branch communities to flooding. Over a period of 44

years the Corps of Engineers has engaged in studies to consider solutions to the flooding problems along the West Branch. To date, four major flood water retention structures have been constructed in the West Branch Susquehanna subbasin. The flood of June 1972 emphasized that a broad regional flood problem remains unresolved in this subbasin.

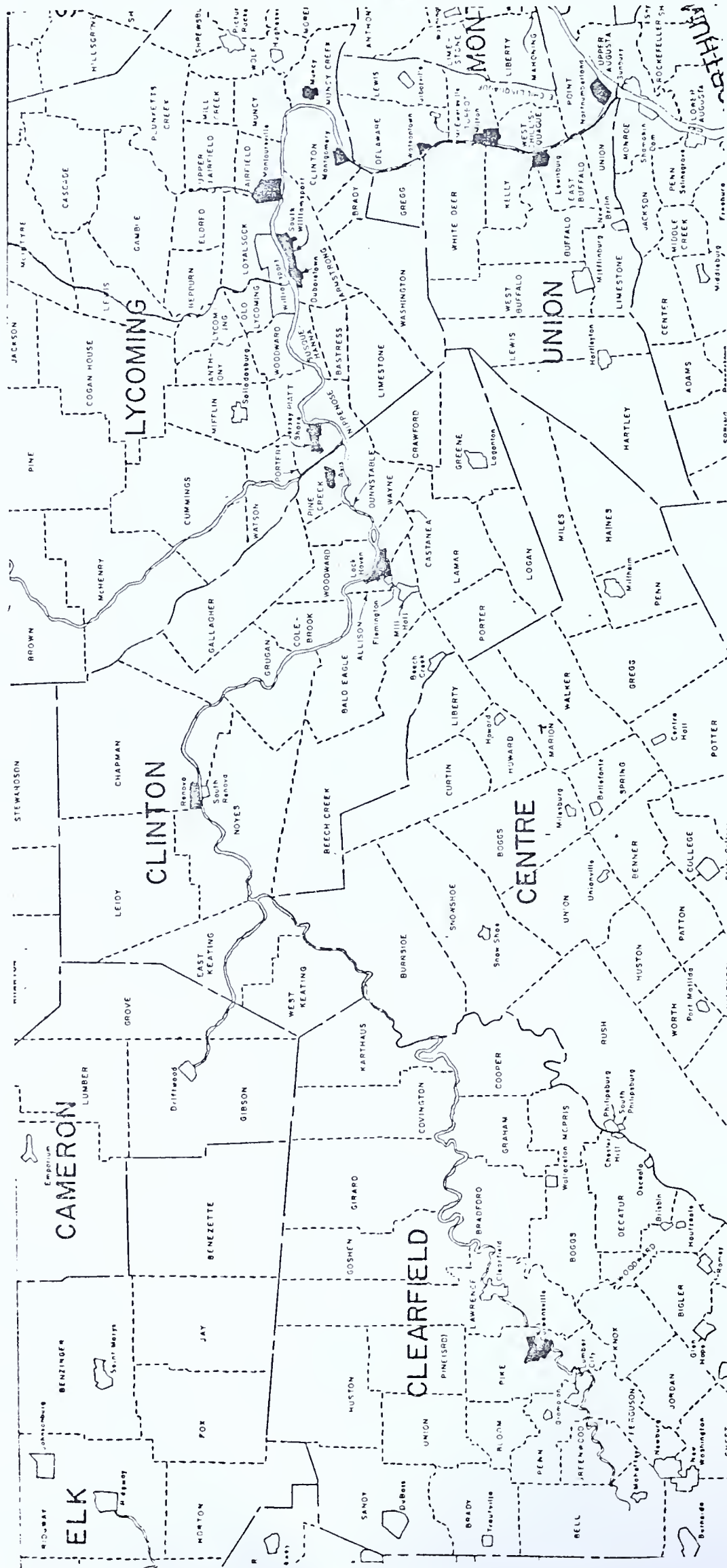
There is an obvious need to protect the City of Lock Haven from future flood damages. The City's flood history coupled with the heavy development within the flood plain merit the Corps' past and current efforts to provide a reasonable level of flood protection. Approximately 955 acres, or over 55%, of the City and the immediately adjacent area were inundated by the 1972 flood. The proposed project will protect the City from a recurrence of a 500-year flood.

The staff review revealed three major areas of concern. They are:

1. the remaining regional nature of flooding along the West Branch,
2. the mainly local benefits of the proposed wall/levee project for Lock Haven, and
3. the nature of the public response relative to the cost apportionment of the proposed project.

It is recommended that:

1. The project, as proposed in the Phase I General Design Memorandum, be included in the Commission's Comprehensive Plan, Section IV - Early Action Program for funding and construction as soon as possible.
2. The Commission support the Corps request that the proposed project be authorized for construction.
3. That the Corps final report acknowledge the remaining widespread vulnerability to flood damage of communities throughout the West Branch Susquehanna River, and the need for continuing consideration of a regional solution incorporating nonstructural and structural measures to reduce future flood damages in this river basin.



CITIES AND BOROUGHS (POP. 1,000 OR MORE)
ON THE WEST BRANCH SUSQUEHANNA RIVER
THAT ARE VULNERABLE TO FLOODING

